LISICOS: The Long Island Sound Integrated Coastal Observing System

First Interim Report, March 2005

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Brief Project Summary: With more than eight million people living in its watershed, Long Island Sound (LIS) is the nation's preeminent urban estuary. LIS provides the region with natural resources, including oysters, clams, lobsters, and bluefish, and both commercial and sport fishing are important to the regional economy. Unfortunately, LIS has also served as the region's sewer, resulting in water quality degradation and critical habitat loss. Extensive wastewater treatment plant upgrades have been mandated to rectify these problems. The high concentration of development along the surrounding coastline has also prompted increased dredging for navigation, electric power transmission, and gas pipelines. The goal of the Long Island Sound Integrated Coastal Observing System is the development of a sustained capability to observe the Long Island Sound ecosystem and an adequate capability to understand and predict its response to natural and anthropogenic changes.

Current Year Objectives:
- Measure carbon flux and benthic Oxygen demand ~~in~~ due the spring bloom in western LIS.
- Measure and monitor fluxes of salt and carbon through the East River
- Provide operational surface current predictions in LIS and adjacent shelf
- Maintain moored instruments,
- Develop data archiving and distribution system for LIS

Accomplishments to Date:
- Deployment and maintenance of five buoys that monitor salinity, temperature, and dissolved oxygen throughout the sound.
- Three of the above buoys provide over-water meteorological observations. One includes a surface wave sensor, and one includes PAR and chlorophyll sensors.
- Development of a three-dimensional circulation model.
- Development and testing of a primary-production respiration model.
- Coupling of the circulation and ecosystem models.
- Implementation of data-base a internet distribution system
- Analysis of existing hydrography to infer exchange between LIS, the Hudson River, and the shelf waters

Task 1. Program Management

In the first half of the contract period we have coordinated the purchase of all equipment and staff hiring for the program. The large pieces (with the exception of the deployable nutrient analyzer) of equipment have all been received and tested with the exception of the support boat. It is currently under construction and scheduled for delivery in July 2005. The availability of suitably qualified Postdoctoral Research Assistant has caused a delay in some of the modeling and analysis work. This has not caused a significant problem since the field observations are scheduled to occur in the latter half of the program. In any event, we have interviewed candidates for the position and expect to recruit one in short order.

Task 2. Sustained Observational Array

We have maintained three moorings in LIS from the beginning of the present contract and added a fourth in Western LIS in January, 2005. Their locations and data can be obtained at http://www.LISICOS.UConn.edu. In addition, we have located sites and prepared for the

installation of two HF RADAR surface current measuring (CODAR) in western LIS at a US Coast Guard Station on Great Captain Island in western LIS and are awaiting a decision on a proposal to the town of Bayville, NY for a site on a town beach. Three additional buoys have been built, and ~~are planned to be~~ we plan to deploy them in May. We are considering new data telemetry systems and have had discussions with the US Navy and citizens of the Town of Stonington regarding expansion of the network to address their needs.

The mooring support vessel is under construction and scheduled for delivery in June. It has been designed with a lifting capability adequate to service most of the buoys and other heavy equipment that is integral to LISICOS. To sustain the operational capability of the vessel we are energetically pursing a benefactor to provide an endowment that will be matched by the State of Connecticut.

Task 3. Modeling and Data Analysis

The modeling and data analysis component of the program has several sub-tasks underway. The three dimensional circulation and productivity model is near completion. We have included river discharge variability and studied the model performance in simulating the observed hydrographic variability with promising results. We have also established that the sea level variability is effectively simulated at both tidal and subtidal frequencies. We await the data from the process studies to be conducted in the summer of 2005 for further critical evaluation. We are preparing to use the circulation predictions to provide maps of the circulation throughout the Sound via the LISICOS web site.

Progress is also underway on the simpler models. The BZI model has resulted in a paper that has been submitted for publication. A second paper that exploits archived salinity observations to estimate the longer-term transport of materials in LIS has been prepared and is almost ready for submission.

Task 4. Process Studies

In March of 2004 the RV Connecticut, and the RV Challenger with a large team of LISICOS investigators undertook an intensive survey of the Western Sound to estimate the production and fate of the spring bloom. Primary production, micro and mesozooplankton grazing, water column respiration, downward flux of carbon and nitrogen, and benthic oxygen demand were measured in the western Sound for three days during the bloom. In addition, nutrients, particulate and dissolved organic carbon, chlropopphyll, and zooplankton abundance were measured during the same period. Circulation and the hydrography were measured during rapid night time surveys. The analysis of this large data set is underway. We believe it is the most comprehensive, if not the first, detailed examination of this period of high production. Without the moored array augmented by the sequentially sampling particle traps and benthic chambers provided by the LISICOS observatory infrastructure this would not have been possible.

Task 5. Data Management

We have purchased and installed new computers to facilitate data archiving and distribution. We have also acquired the database management software (Microsoft SQLserver) and have configured it to archive the real-time data from the LISICOS buoy array and the survey data acquired by the Connecticut DEP surveys.

To distribute data and data-based products we have installed ESRI's ARCIMS software and have developed a prototype system for web-based dissemination using on-line forms for time series data display and downloads. We have also continued to provide meteorological and oceanographic data to the National Data Buoy Center.

Task 6. Public, College and K-12 Education

The LISICOS team has developed a collaboration with the University of Connecticut's School of Education to develop science curriculum materials that exploit the LISICOS infrastructure. The collaboration has resulted in a proposal to the COSEE program at NSF to establish an association with UConn's component of the Carnegie Foundations Teachers for a New Era (TNE) program.

Task 7. Outreach to Users

We have met with the leadership of the Connecticut DEP and the EPA's Long Island Sound Study to discuss how the LISICOS infrastructure can be most useful to their missions. In the early stages of the program we have committed to cooperatively develop database infrastructure that is consistent with that already in use by the DEP managers and to provide a convenient interface for access. They also agreed to provide us with data from their survey programs.

We have coordinated with EPA's Long Island Sound study to coordinate surveys and equipment availability. We also collaborated with the U.S. Coast Guard, The University of Rhode Island and Rutgers University to provide CODAR-based current forecasts for search and rescue operations. Recently, we have engaged Science Applications Inc., of Mystic, CT, to collaborate on the development of improved CODAR data algorithms.

In addition to maintaining close ties to the local user community we have collaborated with Dr. Thoroughood of the University of Delaware to host a regional workshop to help establish the Middle Atlantic Coastal Ocean Regional Association (MACOORA). In November of 2004 we hosted a local meeting of the people interested in MACOORA to develop a contribution to the larger regional association planning process.

Citizens concerned about the water quality in the harbor of Stonington, CT, have requested assistance. We have met with the leadership of the group to answer questions and will be conducting some preliminary surveys of nutrients.

Task 8- Technology Development

There is a clear need for the capability to measure the oxygen demand of the sediment in-situ, and to assess the consequences of the low oxygen on the geochemistry of the benthos. Prof. Fitzgerald has constructed a benthic chamber for this purpose has conducted tests in February in western LIS and at the UConn dock at Avery Point. Evaluation of the performance of the system is underway.

Summary
The LISICOS program is proceeding largely as planned. There have been a few delays associated with hiring of personnel; however, the distribution of field and modeling work has allowed us to accommodate this difficulty without slowing our progress. Plans for the summer effort are in place. The intensive mooring array will be deployed in May and the observation period will occur during a hectic two-week period of August.